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HEPAP 5 Aug 2002

REU and RET at Wayne State

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REU/RET Quick Introduction

Research Experience for Undergraduates

NSF program (NSF-02-136 is the latest Announcement) which "...supports active research participation by undergraduate students in any of the areas of research funded by the NSF". Two sorts:

Sites Larger ($\sim$10 students) at University Departments, Labs, or large experiments (LIGO). About 50 of these in NSF Physics.

Supplements Smaller (1 or 2 students) as supplements to research grants. About 100 of these in NSF Physics.

The program supports about 700 students/year in physics. Students get stipends for summer research activities and usually travel and housing support.

REU/RET Quick Introduction

Research Experience for Teachers

The RET program is similar but for K-12 Science, Math, and Engineering teachers. At the moment it only is only a "Supplement" type program typically to REU sites. This program is smaller supporting about 300 teachers/year.

Wayne State is an REU/RET site and supports 10 students and 4 teachers each year. This summer is its fifth year.

The clear intent of both programs is to increase the number of undergraduate students majoring in Science, Math, Engineering and Technology fields. Emphasis on recruiting women and the under represented. There is much anecdotal evidence that participation in research as an undergraduate is the starting point for a career in SMET. In physics 90% of graduate students participated in undergraduate research. Compare with bachelor physics majors not going to graduate school in physics, only 2/3 have a research experience. (Recent AIP survey)

The links forged between K-12 teachers and university groups by teacher participation in research may be an invaluable recruiting tool. Also enhances teacher professional development.

See direct evidence for these effects when I assess the Wayne State program at the end.

Implementation at Wayne State

Program designed by Giovanni Bonvicini. Key input from Dave Cassel (Cornell) and Ed Thorndike (Rochester) in the first years. Lots of feedback from students and teachers, for example giving credit for the preparatory class, to keep the program working well. Learned much from the REU Site at Cornell LEPP about how to give the students a good summer experience (Rich Galik, Nari Mistry, Gerry Dugan).

Recruiting

Start with students in our calculus based introductory physics class who are recommended by the instructors during the fall. Dominated by sophomores. Most are engineers and find that only about 1 in 3 are interested in a non-"Big 3" summer experience. (A uniquely Detroit problem.) (50%) Fill the rest mostly with outstanding minorities from the math department via a Vice President in the Wayne State Office of Minority Affairs (William Hill). (30%) Not much success until this year (2/9) in attracting students from local colleges (fliers and visit program). Rest of students are personal contacts from physics professors or from past student participants in the program. Typically recruit 11 or 12 as a few always drop out when we start to make summer travel/housing plans.

Teacher recruiting began with Bonvicini talking to a local science high school techer association (MDSTA). Since then, via word of mouth from the past participants, we have done no teacher recruiting and have interested teachers on a waiting list. Half from Detroit, and half from suburbs.

Preparatory Class

Unique feature of our REU. Meets 1 hour/week during Winter Semester. 1 Credit hour. First 2/3 of the course is us introducing the material.

Week	Topic	Speaker
1	Introduction to Particle Physics	Alexey Petrov
2	Introduction to Nuclear Physics	Sean Gavin
3	Accelerator Physics	David Cinabro
4	Analysis Techniques	Claude Pruneau
5	Statistics	David Cinabro
6	Particle Detectors and CLEO	Giovanni Bonvicini
7	Star Experiment	Rene Bellwied
8	BTeV	David Cinabro
9	Computers I: Unix	Sean Gavin
10	Computers II: Languages	Alexey Petrov

Preparatory Class

Talks as PDF's available through web site. Generally they are vocabulary lessons and help the students get over the feeling of being overwhelmed by a torrent of new material when they start their summer research. Saves start up time during the summer. All students given unix accounts and encouraged to learn computing beyond Windows.

We try to connect students to summer projects and mentors, lots of help from CLEO spokes and Cornell LEPP REU program, after week 8.

Last 4 weeks are student presentations of their summer projects, usually prepared after contact with and input from their summer mentors.

Housing, travel, and adminstration are handled by a technical secretary paid 50% time out of the REU grant. Removes a tremendous time drain from the program PI's and CLEO spokes.

Summer Research

Ten weeks for students, six weeks for teachers. Key is finding projects of the right size and difficulty. In the first two years all went to Cornell LEPP mentored by CLEO PI's and CESR staff (CLEO III construction and CESR upgrade), but in the last two years half go to BNL (RHIC and Star), and this year 2/13 working with me on BTeV at Fermilab. The list of projects from last summer:

Summer Research

Student	Project	Mentor
Massoud Assadi (T)	STAR	Rene Bellwied
Edith Carter (T)	X-Ray Microscopy	Ernie Fontes
Nadine Credi	Neutron Fluctuations	Claude Pruneau
Jeremy Dick	Global Accelerator Net	Don Hartill
Mark Hanna	Strange Enhancement	Claude Pruneau
Lakjinder Kang	Helium TPC	Giovanni Bonvicini
Christina Lopez	Long. Beam Motion	Mike Billing
J. Oosterhout (T)	Auto Crystals at CHESS	Chris Heaton
Nicholas Powell	$\Upsilon \rightarrow f_J(2220)$	Rich Galik
Megha Sehdev	$p\bar{p}$ Correlations	Rene Bellwied
Shalhout Shalhout	Charm jet tagging	David Cinabro
Wilbert Sherrod (T)	RHIC	Rene Bellwied
Terrance Strother	Baryon Fluctuations	Sean Gavin

Summer Research

Besides research students attend weekly lectures, participate in social activities with students from other REU programs, and attend arranged tours of other research facilities located at Cornell. Similar at BNL and Fermilab. At Cornell they live with the Cornell LEPP REU students in a large house on campus which they like a great deal.

Students give two presentations, after three weeks and at the end, and produce a 5 page paper describing their summer activities.

After Completion

There is an automated survey and we meet with the whole group at the beginning of the Fall semester for a feedback session. This was very useful in the first two years in designing the program, and now used to document the impact.

Very good students are hired by the Wayne State CLEO and Star groups to work with us during the school year. Two or three each year.

We also do lots of letter writing for the students and give help/advice on careers beyond undergraduate. We visit the classes of the RET's in the fall to talk about our research and invite them to recruitment events at Wayne State physics.

Assessment

Past Performance

Measure	
Students	43
Teachers	14
Women	24 (42%)
Under Represented	23 (40%)
First Time College	32 (74% of students)
Physics Majors	18 (42% of students)
SMET Graduates (3 years)	17 of 18 (94%)
Graduates to Graduate School (3 years)	35%
Journal papers with REU/RET authors	4

Very good. Excellent diversity and SMET graduates. Want more physics majors and would like more students to continue to graduate school. These last two are perhaps a bit skewed by the late 90's boom in computer related jobs which had the "Big 3" hiring the computer literate with reckless abandon until mid-2000.

Assessment

Future Directions

Trying to leverage the program as a recruiting tool. We have Yet to have an incoming freshman physics major at Wayne State who was a student of an RET alumni. We are clearly stirring enthusiasm among the teachers as evidenced by our "word of mouth" recruiting. Also they and their students have been disproportionate participants at Wayne State Physics events such as Research Open House and Telescope Viewing.

Program has been part of reversing a long decline in numbers of undergraduate physics majors at Wayne State. 50% of physics batchelor degrees have been through this REU, another 25% through another REU at Wayne State Engineering, in the last three years.

Also trying to attract students to graduate school in physics at Wayne State. A likely success with a 2002 student from Wabash College in Indiana.

Conclusion

A very valuable program. An asset to both education and research at Wayne State physics.

Very useful at Cornell LEPP. Strong element of diversity, research, and excellent outreach tool.

Wayne State Program website: `http://rhic15.physics.wayne.edu/REU/`

Cornell LEPP Program website: `http://w4.lns.cornell.edu/public/reu`

NSF REU homepage: `http://www.nsf.gov/home/crssprgm/reu/start.htm`

AIP Surveys: `http://www.aip.org/statistics/trends/phystrends.htm`